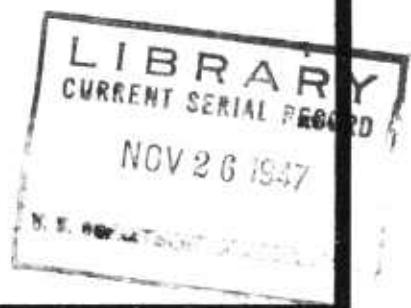


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The SPINOSE EAR TICK



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EAR TICKS are blood-sucking parasites which infest the ears of cattle, horses, sheep, dogs, and other animals. They are prevalent in the semiarid sections of the southwestern part of the United States, where they cause heavy losses among livestock.

The parasites cannot be eradicated by dipping, but they may be controlled and the losses prevented by injecting into the ears of infested animals a mixture of benzene hexachloride-xylol-pine oil or a mixture of pine tar and cottonseed oil. Another method is to apply a pyridine-adhesive mixture with a paint brush.

A brief description of the tick, its life history, and instructions for treating infested animals are given in this bulletin.

THE SPINOSE EAR TICK AND METHODS OF TREATING INFESTED ANIMALS¹

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INTRODUCTION

THE SPINOSE EAR TICK² takes its common name from the characteristic spines on the body of the young tick and from its habit of locating in an animal's ears. This parasite is especially prevalent in the arid and semiarid sections of the southwestern part of the United States, the infested area extending, however, to the Rocky Mountain States as far north as Montana and even into Oregon. The climatic conditions in parts of Texas, Oklahoma, New Mexico, Arizona, and California seem to be favorable for the rapid multiplication of ear ticks, which have become very prevalent in those States. They are also widely distributed in parts of Mexico and South America, and may occur in Central America as well. The ticks remain attached in the ears of animals for several months, and shipments of livestock from the infested areas to various points in the United States have caused the ticks to become widely disseminated. Moisture, however, is apparently detrimental to the ticks during certain stages in their life cycle, since they do not seem to be able to establish themselves in any part of the United States except the arid and semiarid sections of the Southwest and Pacific coast.

Among domesticated animals, the ticks are found most frequently in the ears of cattle, horses, dogs, and sheep, and under favorable conditions they often attach themselves to other animals, such as goats, hogs, and cats, and occasionally even man. Wild animals, such as coyotes, deer, mountain sheep, and especially jack rabbits, in infested areas often harbor many ear ticks.

As the movement of wild animals cannot readily be controlled, eradication of ticks by any method of excluding susceptible animals from infested areas so as to bring about the starvation of the ticks appears to be impracticable.

¹ This is a revision of former editions by Marion Imes, retired.

² *Otobius megnini* (syn. *Ornithodoros megnini*).

Serious damage to livestock is caused by these parasites in the areas where they are abundant. It is not unusual to find the ear canals of cattle and horses completely filled with a mingled mass of ticks and particles of ear wax and other matter (fig. 1, *A*). As many as 75 ticks by actual count have been taken from 1 ear of a cow selected at random from an infested herd. The parasites puncture the tender skin of the ears and suck blood from the animal. The wounds thus caused occasionally become infected with pus-forming organisms which give rise to a condition commonly known as "ear cancer." Constant irritation caused by gross infestations may result in a loss of flesh and an unthrifty appearance. Added to the damage caused by the ear tick is the constant danger of screwworm fly attack in areas where this pest is prevalent. When animals are badly annoyed by ticks, they may scratch their ears and produce wounds which attract screwworm flies. Old range cows and weak, poorly nourished animals when grossly infested often die during late winter and early spring.

NATURE AND HABITS OF EAR TICKS

Investigations by the Bureau of Entomology and Plant Quarantine show that spinose ear ticks do not spend their entire life on the animal. They enter the animal's ears as small, active, six-legged seed ticks or larvae, not easily visible to the naked eye. Usually they attach themselves to the tender skin inside the ears below the hair line, where they are protected from natural enemies as well as from the efforts of the animal to dislodge them. They begin at once to engorge with blood and in a week or two are fully engorged and although still small have grown to several times their original size.

The engorged larvae are inactive, grublike in appearance, and of a yellowish-white or pink color (fig. 1, *B*). When these larvae shed their skin the young ticks or nymphs emerge, provided with eight legs (fig. 1, *C*). The skin of the nymph is covered with numerous small spines (fig. 1, *D* and *E*). Before they begin to engorge, the nymphs are about the same size as the engorged larvae, that is, about one-eighth of an inch in length (fig. 1, *C*). They attach themselves to the skin lining of the ear, suck blood, and slowly increase in size. Occasionally they change their location. Unless destroyed or accidentally dislodged, they remain in the ears from 1 to 7 months, or until they are fully grown and completely engorged with blood. Their length then ranges from about one-third to two-fifths of an inch (fig. 1, *F*).

Finally, upon the completion of their development as parasites, they drop out of the ears and usually crawl up several feet from the ground, secreting themselves in dry protected places such as cracks and crevices in buildings, fences, corral walls, and trees. In such places, a few days after leaving the animal, the nymphs shed their skins and undergo their transformation into adult ticks (fig. 1, *F* and *G*), mating of the sexes occurs, and there also the eggs are laid.

The skin of the adult, unlike that of the nymph, is without spines. So far as is known, the spinose ear tick is parasitic only in the larval and nymphal stages, and the adult never attaches itself to a host, nor does it take food. Soon after mating, the females begin laying eggs. Egg laying may be intermittent and continue over a period as long

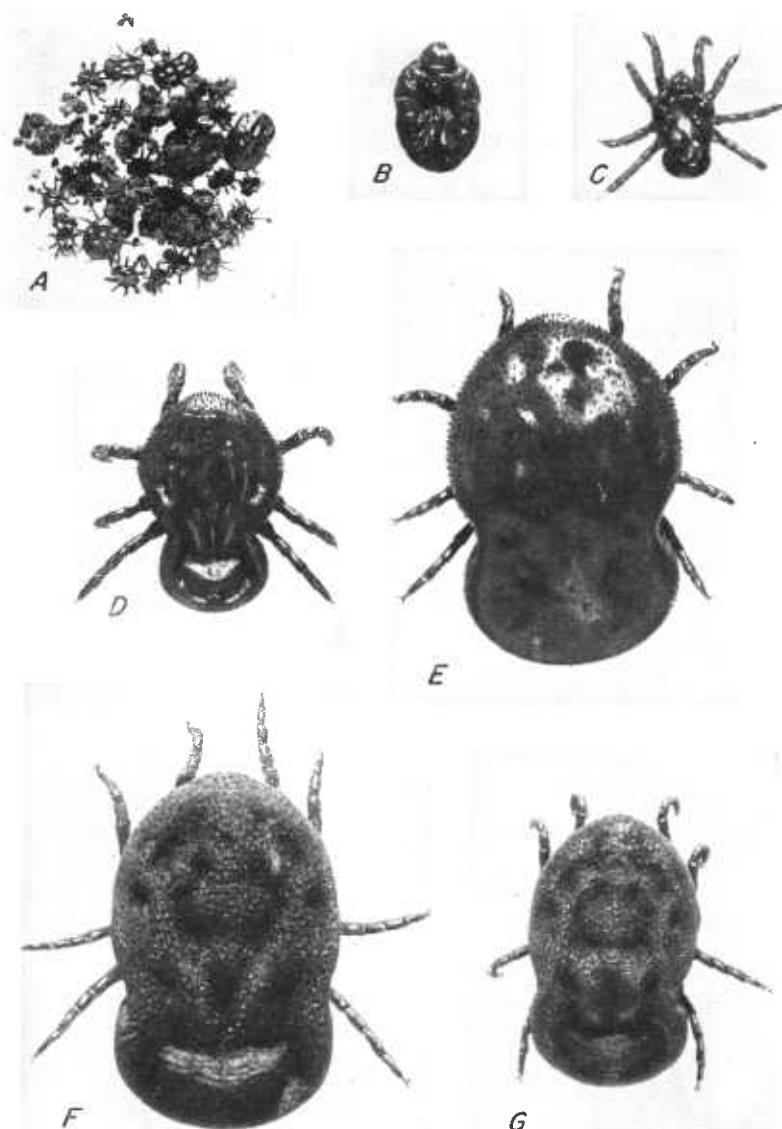


FIGURE 1.—*A*, Ear ticks and debris from ear of cow (about natural size). *B*, engorged larva (magnified five times). *C*, Young tick (magnified five times). *D*, Partially engorged young tick (magnified five times). *E*, fully engorged young tick (magnified five times). *F*, Adult female (magnified five times). *G*, Adult male (magnified five times).

as 6 months. When egg laying is completed, the females die. Females which do not find a mate have been known to live more than a year. The eggs may hatch as early as 10 days after they are laid. Shortly after hatching, the seed ticks are ready to attach themselves to any suitable animal with which they come in contact. They have been known, however, to live nearly 3 months without doing so.

DETECTING THE TICKS

When animals are grossly infested and the ear canals are packed full of ticks the parasites are visible on superficial examination, but when the degree of infestation is light or moderate, the ticks may easily be overlooked. They usually attach themselves in the deep folds of the ear or crawl into the ear canal and follow it inward, sometimes as far as the eardrum. As the ticks increase in size and others enter, they and their excretions, together with the wax from the ear of the animal, accumulate in masses or plugs sufficient in some cases to close up the ear passages completely.

These conditions give rise to various symptoms. The infested animal usually shakes its head and repeatedly turns it from side to side. When irritation and itching are more intense on one side, the animal often turns its head toward that side, and the more seriously affected ear is held lower than the other. There is a tendency for the animal to rub and scratch the ears in an endeavor to relieve the irritation, and this may result in extensive lacerations.

In areas where screwworm flies are also present, such wounds invite attacks by this parasite, and coincident infestations, unless properly treated, usually prove serious and may result in death of the animal. Horses and dogs seem to be more sensitive than cattle to the pain and irritation. They scratch and rub their ears, shake their heads, and often lie down and roll, rubbing their ears on the ground.

In all cases where ear tick infestation is suspected, the animals should be examined and if no ticks are visible, the ears should be probed, taking due care, however, to avoid injury to the delicate lining of the ear passages. A convenient and effective instrument for probing the ears, removing the ticks from the ear canals, and breaking down masses of ear wax and ticks may be made from a piece of ordinary baling wire, as shown in figure 2.

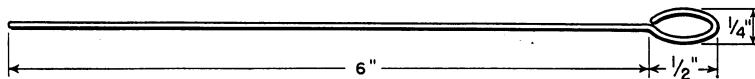


FIGURE 2.—Ear probe made of baling wire.

TREATMENT OF INFESTED ANIMALS

On account of their habits and great vitality, and the wide range of the animals which they may infest, complete eradication of spinose ear ticks is a very difficult matter. Results of investigations conducted by the Bureau of Animal Industry have shown that dipping in any of the known dips is not effective in killing the ticks or causing them to leave the ears. The only effective method of treatment known at

present is to apply the remedy by hand directly in the ear passages (fig. 4). The remedies commonly recommended, such as bland oils, crude petroleum, various dips, etc., are not effective, and they are of use only as vehicles for other remedies.

For a number of years some of the livestock growers in the infested areas have used kerosene or gasoline in treating animals for ear ticks. When applied either undiluted, or diluted with an equal part of discarded engine lubricating oil, these substances will kill the ticks, but they may cause irritation and inflammation of the tender skin lining the ear passages. The inflammation may result in deafness, especially in horses and dogs. As both kerosene and gasoline evaporate rapidly, they offer little or no protection against immediate reinfection. Consequently these remedies are not suitable for use in the ears of domesticated animals, and under no circumstances should they be used on horses or dogs. Chloroform, either undiluted or mixed with a bland oil, is commonly used in the ears of horses and dogs. It is effective, but, like the other remedies mentioned, it affords little or no protection against reinfection.

THE BENZENE HEXACHLORIDE-XYLOL-PINE OIL REMEDY

This new remedy formulated by the Bureau of Animal Industry consists of a mixture of 1 part of benzene hexachloride (also known as hexachlorocyclohexane and gammexane), 2 parts of xylol, and 17 parts of pure pine oil, all parts by weight. The benzene hexachloride that is used in this formulation should be of a technical grade having a gamma isomer content of about 15 percent, or more.

To mix the ingredients, place the benzene hexachloride and xylol in a kettle or bucket and heat to 120° F. with frequent stirring. When the mixture is largely reduced to a liquid, remove it from the source of heat and add the pine oil, with repeated stirring. Since xylol is inflammable, it should be kept away from an open flame. The mixture should be prepared in a well ventilated room, or preferably out of doors. This preparation is not unpleasant to use and will flow freely from a spring-bottom oiler, in winter as well as in summer. Furthermore, this preparation causes no irritation and does not tend to collect dirt in the ears of the animals. The mixture penetrates the masses of ear wax and ticks, and rapidly kills all larvae and nymphs. It also protects the ears against a reinfection for about 3 weeks or longer, even where opportunity for rapid reinfection with ear ticks is great. Livestock grazing on large pastures and ranges, or maintained under certain other circumstances where a reinfection with ear ticks is generally more slowly accumulated, are usually given protection for more than a month.

THE PYRIDINE-ADHESIVE REMEDY

A remedy developed by the Bureau of Entomology and Plant Quarantine, called Stock 1029,³ is a mixture of pyridine in an adhesive containing 45 percent rosin, 40 percent hydrogenated methyl abietate (commercially sold as Hercolyn), and 15 percent dibutyl phthalate.

³ For full details of this remedy, Department Circular No. E-695, entitled "Control of the Ear Tick," should be consulted.

The adhesive base (called Adhesive A58) is made up by blending the aforementioned ingredients (except pyridine) under cautious application of heat and constant stirring until the rosin is liquefied. The operation should be carried out in a well ventilated room or in the open, and care should be taken not to overheat the mixture. After the mixture has been allowed to become almost cool, 10 percent by weight of pyridine (practical grade) is added and the resulting product (Stock 1029) stirred into a uniform preparation. Pyridine is inflammable and must be kept away from open flame.

Experience with Stock 1029 indicates that it destroys ear ticks effectively and provides reasonable protection from reinestation for considerable periods of time.

THE PINE TAR-COTTONSEED OIL REMEDY

An effective remedy against ear ticks was formulated by the Bureau of Animal Industry some years ago and thoroughly tested during its early field investigations. This remedy consists of a mixture of 2 parts by volume of ordinary commercial pine tar and 1 part by volume of cottonseed oil. In mixing the ingredients add the cottonseed oil to the pine tar and stir until a uniformly smooth mixture is obtained. When the weather is cold the pine tar and cottonseed oil should be warmed so they will mix readily and flow freely, but they should not be heated more than is necessary. The mixture will remain uniform for a long time without separation or deterioration. It is relatively inexpensive, easy to prepare, and when properly applied it kills the ticks, and does not injure the animals. It may be used on any species of domestic animals.

Cottonseed oil is a fairly good solvent for ear wax, and the pine tar-cottonseed oil mixture penetrates ordinary loose masses of ear wax and ticks, but it will not penetrate the hard masses. It kills all ear ticks with which it comes in contact, and being of a sticky consistency, it remains in the ears and protects the animals against reinestation for approximately 1 week.

RESTRAINING THE ANIMALS FOR TREATMENT

The farmer who has but a few gentle farm animals to treat does not need any special equipment for restraining them during treatment. They may be tied to a post, held by an attendant, or restrained by any of the well-known methods. But in treating herds of semiwild range cattle or horses, it is necessary to provide special equipment. Most animals oppose the insertion of anything into their ears; therefore restraint is often necessary to hold the head quiet enough to have the ears readily accessible to the operator. A dehorning chute equipped with a stanchion is one of the best arrangements for restraining cattle during treatment for ear ticks. Branding chutes with "squeeze gates" are also satisfactory for this purpose. The entrance chute at dipping corrals, or any other available cattle chute may be used (fig. 3).

If it is necessary to construct a chute especially for the purpose, it should be about $2\frac{1}{2}$ feet wide and from 4 to 6 feet high, depending on the nature of the animals to be treated. When the sides of the chute are more than 4 feet high, footboards should be constructed along the

sides so that the operator may work over the top of the chute and not through the openings in the sides. When cattle are crowded closely in the chute, with the exit and entrance closed, they may be treated without additional restraint. However, confining the head in a "squeeze gate" invariably permits a more thorough job of treatment and also provides greater safety for the operator.



FIGURE 3.—Chute filled with cattle ready for treatment; one side of the chute is made of iron pipes to facilitate handling the animals.

INSTRUCTIONS FOR TREATING ANIMALS

An ordinary metal spring-bottom (press bottom) oiler of about 1-pint capacity is the most suitable instrument for injecting the benzene hexachloride-xylol-pine oil and pine tar-cottonseed oil ear tick mixtures into the ears (fig. 4). The spout should be cut off so it will be only 2 inches long, thereby creating a spout opening about three-eighths of an inch in diameter. A piece of flexible soft rubber tubing, with a $\frac{3}{8}$ -inch inside diameter, $2\frac{1}{2}$ inches long should be slipped over the oiler spout and the rubber should extend about one-half inch beyond the end of the spout tip. The tubing will guard against injury to the delicate inner lining of the ear by the sharp edges of the metal spout-tip while the oiler spout is being inserted.

When the pine tar-cottonseed oil mixture is used, it must be warmed to about body temperature so it will flow readily from an oiler. The benzene hexachloride-xylol-pine oil mixture flows freely when cold.

Fill the oiler with the medicament, grasp the ear with the left hand, insert the oiler spout into the opening of the ear canal and inject one-half ounce into each ear. While the injection is being made, the ear should be manipulated with the left hand so as to facilitate the spread of the mixture over the entire inner surface of the ear (fig. 5).

Hold the ear in an upright position for a few seconds after the injection to allow the fluid to settle into the canal. When the hold on the ear is loosened, the animal will shake its head violently, throwing out the excess of the mixture.

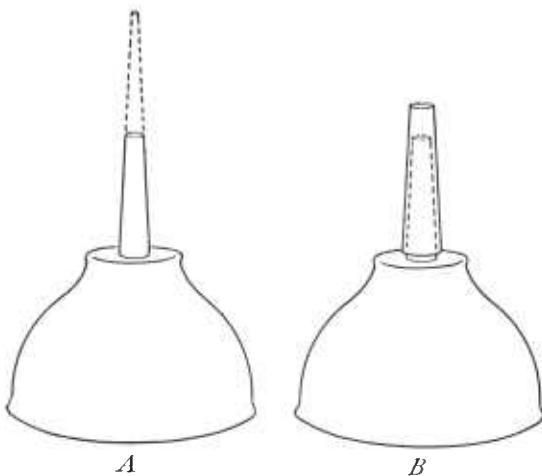


FIGURE 4.—*A*, Spring-bottom oiler showing spout cut off at 2-inch length; *B*, spring-bottom oiler showing rubber tubing, $2\frac{1}{2}$ inches long and $\frac{3}{8}$ inch in diameter, slipped over spout.



FIGURE 5.—Treating cattle for ear ticks, showing animals crowded in chute and method of holding and manipulating the ear.

The benzene hexachloride-xylol-pine oil mixture is in itself a solvent, and will penetrate even the hard masses of ticks and ear wax. Its free-flowing quality permits rapid and complete distribution over the surface of the ear obviating the need for breaking the ear wax masses,

except in the most extreme instances. This preparation readily contacts all larvae and nymphs in the ear, kills very rapidly, and is not irritating to the inner surface of the ear and adjacent skin areas.

The pine tar-cottonseed oil mixture will kill only the ticks with which it comes in contact; consequently if the ear passages contain very hard masses of ticks and ear wax, such masses should be broken down and scraped out with a wire loop (fig. 2) before treatment is applied.

If an excessive quantity of the fluid is injected, the surplus overflows from the ears and runs down over the head and face, where it may cause irritation, especially in horses. It causes little or no irritation in the ears, but if it comes in contact with those parts of the skin covered with hair that are exposed to the sun, irritation results and the hair may come out. No more should be applied than the ear will retain; about one-half ounce in each ear is sufficient for cattle and horses.

The pyridine-adhesive remedy (Stock 1029) should be applied to the ears with a 1-inch paint brush. A brushful of the mixture should be inserted well down into the outer ear and rubbed about enough to insure complete coverage of the deep convolutions and the inner surface of the outer ear. One gallon of Stock 1029 will treat about 125 head of cattle.

After having had sufficient practice to become familiar with the operation, one man can treat 30 or more cattle an hour. In treating large herds, two or more men may work along each side of the chute and in this way a large number of animals can be treated in a day.

NUMBER OF TREATMENTS NECESSARY

When properly used, one application of the aforementioned ear-tick mixtures is usually sufficient to kill all ticks in the ears of the animal at the time of treatment. It should be remembered, however, that the eggs of the tick are not deposited or hatched in the ears of the animal, and that a new crop of seed ticks may find lodgment at any time on animals kept in infested places.

The benzene hexachloride-xylol-pine oil mixture contains no special adhesive but nevertheless clings to the inner lining of the ears for a considerable period. Not less than 3 weeks' protection against reinfestations is usually provided where ticks are abundant, and for periods of well over a month where ticks are few in number. A comparable period of protection from reinfestation appears to be afforded by the pyridine-adhesive remedy (Stock 1029). The pine tar-cottonseed oil mixture remains in the ears for a short length of time and may be depended upon to protect the animal against reinfestation for only about 1 week, although in some cases it seems to afford protection for a longer period.

Cattle are generally more heavily and much more rapidly reinfested with ticks when confined to old corrals and small pastures than when grazed on large, open ranges. The opportunity for the animals to contact masses of seed ticks is naturally greater in small, confined areas.

Infested pastures contain particularly heavy concentrations of ticks in the soil and debris under and around salt troughs. These ticks are readily destroyed by spraying such areas with a mixture prepared

from equal parts of kerosene and used lubricating oil. When feasible, the destruction of ticks in this manner is a valuable adjunct to control.

Animals in the infested area should be examined at frequent intervals and treatment applied as often as necessary, preferably at 2-month intervals, to protect them against the discomfort and losses caused by ear ticks. Herds grazing on infested ranges should at least be treated late in the fall or early in the winter to prevent the winter and spring losses caused by the ticks in poorly nourished range cattle. All animals in an infested herd should be treated whether they show infestation or not.